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Houston Business
A Perspective on the Houston Economy

Oil-Related Employment: Long-Term Adjustment in Nine Cities

Comparisons were made for all nine cities to capture unseeable, unmeasurable variables such as technology and industry restructuring.

The August 1998 issue of *Houston Business* showed how changes in business conditions in the American oil industry affect oil-extraction employment in nine cities. The focus was short-term, using an equation that relates local oil employment to the U.S. business cycle, the domestic rig count and the real trade-weighted value of the dollar. This same equation also contains information about longer term changes in oil-related employment as the oil industry has adopted new technology, restructured operations, outsourced employment and consolidated more and more operations into Houston. These long-term changes, again comparing nine oil cities, are the subject of this article.

METHODOLOGY

As explained in the last issue, the equation applied to all nine cities is simple:

$$y_t = a + ct + b_1X_{1t} + b_2X_{2t} + b_3X_{3t} + u_t.$$

Here, y_t is oil-related employment (mining or manufacturing) at time t, t is a trend term, X_1 is the U.S. unemployment rate, X_2 is the Baker Hughes rig count and X_3 is the real trade-weighted value of the dollar. The short-term changes in this relationship depend on the estimated parameters b_1, b_2 and b_3, which (because a logarithmic functional form is used) are interpreted as elasticities—that is, as the percentage change in oil-related employment in response to a 1 percent change in X_1, X_2 or X_3. These elasticities were the focus of the last article and were used to compare short-run job

response over time and across cities. The parameter c is a growth rate for employment independent of these short-run factors. The u_t is a residual random error.

The equation has been estimated to distinguish two periods, 1975 through 1986 and first-quarter 1987 through first-quarter 1998. Suppose the above equation represents the 1975–86 period, and the equation for the 1987–98 period is

$$y'_t = a' + c't + b'_1X_{1t} + b'_2X_{2t} + b'_3X_{3t} + u'_t.$$

The focus of the last article was in terms of the difference in the parameters b_1 and b'_1:

$$b'_1 - b_1,\ b'_2 - b_2,\ b'_3 - b_3.$$

Comparisons were made for all nine cities. In this article the relevant comparisons are for the intercept and trend parameters: $a' - a$, $c' - c$. As discussed in more detail below, these parameters try to capture unseeable, unmeasurable variables such as technology and industry restructuring. The results are necessarily crude and inexact, but a comparison across the nine cities proves insightful.

LONG-TERM CHANGE

Table 1 shows the 1986–97 change in mining employment (dominated by oil and gas extraction) for these nine cities, as well as a comparable change for all U.S. oil and gas extraction. Although the nine cities average a 20.2 percent decline, their performances vary widely. Houma–Thibodaux and Lafayette add oil extraction jobs, and Houston and New Orleans sustain relatively mild percentage declines. In contrast, Dallas, Denver, Oklahoma City and Tulsa suffer 40 percent to 60 percent declines in mining employment.

What is the cause of the large declines in mining in some cities? Short-run industry conditions have often put tremendous downward pressure on employment, so where long-term change has not contributed to job growth, employment has shrunk rapidly. The U.S. rig count, for example, averaged 2,263 from 1975 to 1987 but only 849 from 1987 to 1997. In the typical city, a decline in mining employment of 4 percent to 5 percent per year after 1986 is implied by such a fall in the rig count. Cities not favored by long-term structural gains see employment continue to fall after 1986.

For manufacturing the picture is somewhat brighter, as the number of factory jobs rose 15.6 percent in these nine cities collectively between 1986 and 1997. This is a substantially better performance than that of the United States overall, which lost 1.5 percent. Again, there is wide disparity among the nine cities. Only Bakersfield (–2 percent) and Denver (–4.1 percent) lost manufacturing jobs, while Houma–Thibodaux, Houston and Lafayette all increased manufacturing employment by more than one-third.

What causes wide differences among cities? A number of compelling reasons can be offered for the continued decline in oil-extraction employment, for recent geographic shifts in employment, and for the relative gains and losses in oil-related employment among the nine cities.

Low oil prices, for example, have been a key factor in restraining industry job growth, as OPEC now recognizes oil-on-oil competition from basins around the world. OPEC seeks cartel rents but recognizes prices must be set low enough to explicitly discourage exploration and production in non-OPEC basins, including those in the United States.

Price volatility in oil markets has increased since 1986, and it now shapes every oil company employment decision by forcing firms to carefully manage short-run costs. Oil companies must be able to expand or contract activity quickly in response to changing market conditions. One way to achieve short-run flexibility is by hiring fewer workers for the permanent payroll and shifting oil market risk to tempo-

Table 1
Mining Employment in Nine Oil Cities, 1986–97
(Thousands of jobs)

			Change, 1986–97	
	1986	1997	Number of jobs	Percent
Houston	71.6	67.7	–3.9	–5.4
Bakersfield	13.2	10.7	–2.5	–18.9
Dallas	21.3	11.3	–10.0	–46.9
Denver	16.7	6.9	–9.8	–58.7
Houma–Thibodaux	6.4	7.2	.8	12.5
Lafayette	11.9	15.0	3.1	26.1
New Orleans	16.3	15.2	–1.1	–6.7
Oklahoma City	12.7	7.3	–5.4	–42.5
Tulsa	16.6	7.7	–8.9	–53.6
Nine-city total	186.7	149.0	–37.7	–20.2
U.S. oil and gas extraction	450.3	334.6	–115.7	–25.7

rary employees or to outside suppliers, contractors and consultants through outsourcing.

Another important trend in the 1990s has been the shift of exploration from declining domestic fields to other U.S. basins or overseas. When basins fall out of favor, oil-related employment drops quickly as jobs and equipment are shifted to other regions. Technology centers such as Houston benefit from these trends.

Finally, improved technology is fundamentally changing the oil exploration and extraction business. Important advances—such as three-dimensional seismic, measurement-while-drilling, horizontal drilling and coiled tubing—have lowered drilling cost, reduced risk and widened the range of economic prospects available to the industry.

RESULTS BY CITY

Table 2 summarizes long-term changes that have influenced employment in mining and manufacturing in the nine cities. What we can conclude is limited.

The column labeled "Shift" answers the following question: Is there a one-time shift after 1986 in the number of employees in mining or manufacturing industries? A statistically significant shift upward occurs in six of nine cities in mining but not in any city's manufacturing sector.

Two columns are labeled "Post-86 trend." The first tells us whether the trend term in our equation—a growth rate for jobs independent of the other explanatory variables—changes after 1986. In mining, it shifts sharply downward after 1986 in every city. A very strong upward trend in oil extraction from 1975 to 1986 could probably best be labeled as the oil boom or as speculative excess, and the post-1986 slowdown can be seen as healthy. In manufacturing, only Houma–Thibodaux experiences a significant increase in trend, with other cities the same or down. The next column tells us if any trend remains following the shift downward after 1986, and whether the remaining trend from 1987 to 1998 is positive or negative.

The final column combines the first three to show the average annual contribution of these long-term factors to job growth from 1986 to 1998. The numbers for mining are striking in their range, from –13.9 percent for Dallas to 11.9 percent for Houston. An unweighted average for the nine cities is –1.4 percent. The range is much smaller in manufacturing, and the nine-city average contribution is –0.1 percent.

Table 2
Long-Term Change in Nine Oil Cities

	Shift	Post-86 trend		Annual change (percent)
Mining				
Houston	Up	Down	None	11.9
Bakersfield	Up	Down	Negative	2.9
Dallas	No	Down	Negative	–13.9
Denver	Up	Down	Negative	3.2
Houma–Thibodaux	Up	Down	Positive	.6
Lafayette	No	Down	None	–.7
New Orleans	No	Down	Negative	–6.0
Oklahoma City	Up	Down	Negative	–1.7
Tulsa	Up	Down	Negative	2.6
Manufacturing				
Houston	No	Same	Positive	3.7
Bakersfield	No	Down	None	–3.7
Dallas	No	Down	None	–1.1
Denver	No	Same	None	–1.5
Houma–Thibodaux	Down	Up	Positive	–3.6
Lafayette	No	Same	None	6.6
New Orleans	Down	Same	None	–5.2
Oklahoma City	No	Down	Negative	4.4
Tulsa	No	Down	None	–.7

Why the large differences in the ability to exploit long-term changes in mining? Why the big positives and negatives? We are essentially left with empirical results here—we aren't given much insight into why these numbers arise. The bigger positive values are associated with large one-time shifts, so calculating the percentage change on an annual basis may not be entirely appropriate. Houston's large gains, almost certainly, are part of the ongoing consolidation of the American oil industry into Houston, a trend documented in the April 1996 issue of this newsletter. Houston's large labor force, knowledge pool and available financing have made it an irresistible point for industry-wide consolidation. Four of the nine cities (Dallas, Lafayette, New Orleans and Oklahoma City) have not been able to harness long-run change to their advantage, accelerating their overall employment declines.

In manufacturing, the effects of long-term change fall in a narrower band, and only three of nine cities benefit (Houston, Lafayette and Oklahoma City). Trend growth, not a one-time employment shift, is typically the key determinant here.

Employment continues to grow rapidly in Houston, with 28,000 new jobs added since last December, a pace that nearly matches the strong growth of 1997. The industries generating these jobs have changed, however, shifting away from last year's growth in mining, manufacturing and business services, and toward retailing, construction, and health and legal services. The inherently local character of much current job growth seems to make it an echo of last year's strong expansion, and Houston's economy is still on schedule to cool off as we finish 1998.

RETAIL AND AUTO SALES

Retailing was strong through August, with some areas that had slowed earlier in the summer bouncing back with the advent of the new school year. Summer inventories have been cleared out, fall merchandise is selling well and promotional activity has been relatively limited. Auto sales remain on the strong pace seen all year, running about 7 percent ahead of last year.

OIL AND NATURAL GAS MARKETS

Crude oil remains in oversupply, with storage filled to the brim. Pessimism dominates oil market psychology, as OPEC so far has delivered two-thirds of the production cuts offered. Crude has traded in a $12–$14 range for most of the past six weeks.

Natural gas prices have trended downward in recent weeks, hitting 16-month lows as they slid under $2 per thousand cubic feet in early August. With storage rapidly filling and weather-related demand disappearing as autumn approaches, price is expected to continue to drop until winter.

Low energy prices continue to depress drilling activity from the peak levels of late last year. All domestic drilling is down 22 percent and in Texas is down 34 percent. Oil-directed, gas-directed, onshore, Gulf of Mexico and international drilling all declined significantly in recent weeks.

PETROCHEMICALS AND REFINING

Commodity petrochemicals on the Ship Channel remain under substantial price pressure. A fall in Asian exports is mainly responsible, as domestic demand remains very strong. Profit margins were sheltered earlier in the summer by falling energy prices, but profits are now being squeezed hard. Farther downstream, prices have stabilized over the summer for a few plastic resins, but others—such as polyethylene, polystyrene and PVC—continue to fall.

Refiners have seen mediocre profits, as the summer driving season was good but not spectacular. Very high levels of production also worked to keep profits modest, as Gulf Coast refiners operated at over 100 percent of rated capacity for much of the summer. Attention now shifts from gasoline to heating oil markets as winter approaches.

FINANCE

Depository institutions report little change in credit quality, and loan demand is still very strong. The mix of loan applications has shifted somewhat, away from personal and auto loans and in favor of home equity loans. Deposit growth also remains strong. A combination of a falling stock market and a flattening yield curve has resulted in a decline in financing available for local office, hotel, apartment and other large projects.

REAL ESTATE

Local housing markets remain strong for both existing homes and new homes, and housing starts are 35 percent ahead of a year ago on a year-to-date basis. Office markets continue to improve based on rental rates and occupancy. Much speculation centers on the office market implications of the recent merger of British Petroleum and Amoco and other similar rumored mergers by major oil companies.

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